Social and Ecological Resilience Across the Landscape (SERAL)

Mi-Wok, Summit, and Calaveras Ranger Districts
Stanislaus National Forest

Watershed Management Report

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Analysis Framework: Statute, Regulation, Forest Plan and Other Direction

Protection of water quantity and quality is an important part of the mission of the Forest Service (USDA 2015). Management activities on national forest lands must be planned and implemented to protect the hydrologic functions of forest watersheds, including the volume, timing, and quality of streamflow.

Direction relevant to the action alternatives as they affect water resources includes:

The Clean Water Act of 1948 (as amended in 1972 and 1987): establishes as federal policy for the control of point and non-point pollution and assigns the states the primary responsibility for control of water pollution. Compliance with the Clean Water Act by national forests in California is achieved under state law (see below).

Non-point source pollution on National Forests is managed through the Regional Water Quality Management Handbook (USDA 2011), which relies on implementation of prescribed regional best management practices (BMPs), as well as national BMPs (USDA 2012).

The California Water Code consists of a comprehensive body of law that incorporates all state laws related to water, including water rights, water developments, and water quality. The laws related to water quality (sections 13000 to 13485) apply to waters on the national forests and are directed at protecting the beneficial uses of water. Of particular relevance for the action alternatives is section 13369, which deals with non-point-source pollution and best management practices.

The Porter-Cologne Water-Quality Act, as amended in 2020, is included in the California Water Code. This act provides for the protection of water quality by the state Water Resources Control Board and the regional water quality control boards, which are authorized by the U.S. Environmental Protection Agency to enforce the Clean Water Act in California.

Executive Order (EO) 11988 Floodplain Management (1997) and EO 11990 Protection of Wetlands direct federal agencies to avoid to the extent possible the impacts associated with the destruction or modification of floodplains and wetlands.

A General Order for Timberland Management Activities was issued in 2017 by the Central Valley Regional Water Quality Control Board (Water Board). This General Order provides permit coverage to the Forest Service and is required for all commercial timber harvest activities that will or will likely discharge waste that could affect the quality of the waters of the State.

The Forest Plan Direction (USDA 2017) includes standards and guidelines for Watershed Management.

Beneficial Uses of Water

Uses of water for the Stanislaus River from its sources to New Melones Reservoir are municipal and domestic, irrigation, stock watering, power, contact and non-contact recreation, warm- and cold-water freshwater habitat, and wildlife habitat. Uses of water for the Tuolumne River Basin and its tributaries (sources to New Don Pedro Reservoir) are municipal and domestic, irrigation, stock watering, power, contact and non-contact recreation, warm- and cold-water freshwater habitat, and wildlife habitat (CVRWQCB 2018)**.** The uses that are relevant to project area watersheds are contact and non-contact recreation (i.e., swimming, angling, boating), freshwater habitat (cold and warm water fisheries), and wildlife (amphibian and aquatic reptile species).

Water quality parameters with the most likely potential to be affected by this project are pesticides, water temperature, and the sediment-related measures (sediment, settleable material, suspended material and turbidity) in the Basin Plan (CVRWQCB 2018). Treatment of invasive weeds with herbicides could impact water quality. Ground disturbing activities could initiate sedimentation, and reduction of

vegetation in near-stream areas could raise water temperatures. The Forest Service is responsible for meeting Basin Plan water quality objectives for these parameters.

Management Requirements

On the Stanislaus National Forest, ground-based mechanized equipment operations in Riparian Conservation Areas (RCAs) are divided into three zones (Frazier 2006). The exclusion zone, at the edge of streams or wetlands, prohibits mechanized equipment use. Next, the transition zone allows light mechanized activity. Last, the outer zone allows activity to increase to standard operations beyond the RCA. Together, these zones comprise a wide, graduated RCA buffer zone intended to achieve Riparian Conservation Objectives as well as vegetation management objectives.

The purpose of mechanized RCA operations is to reduce fuel loading and improve riparian vegetation community condition close to streams and wetlands. These operations are carefully conducted to prevent detrimental soil impacts and retain a high percentage of ground cover in the RCA.

Table 1 presents management requirements pertaining to: BMP checklists, operations in RCAs, road activities, stream crossings, log landings, skid trails, water sources, slope and soil moisture limitations, servicing and refueling of equipment, parking and staging areas, prescribed fire, burn piles, application of borate, herbicides, water quality monitoring, and cumulative watershed effects.

Table 1. Management requirements incorporating BMPs and Forest Plan S&Gs

Management Requirements	BMPs/Forest Plan[1]/Locations
BMP Checklists - Prepare a BMP checklist prior to implementation.	**Water Quality Management Handbook** 13.3 Project Implementation **National Core BMPs** Forest Service BMP Process (pg 9) **Locations**: All areas where ground-disturbing activities occur.
Operations in Riparian Conservation Areas - Exclude mechanical harvesting/shredding equipment (low ground pressure track laying equipment such as feller bunchers or masticators) within 15 feet of perennial, intermittent, or ephemeral streams, or SAFs. - Exclude skidding equipment (rubber-tired skidders and track laying tractors) within 50 feet of perennial or intermittent streams or SAFs. - Exclude skidding equipment (rubber-tired skidders and track laying tractors) within 25 feet of ephemeral streams. - Remove activity-created woody debris to above the high-water line of stream channels. - Retain remaining post-fire obligate riparian shrubs and trees that have live crown foliage or are resprouting (e.g. willows, alder, dogwoods and big leaf maples). - Do not damage streambanks with equipment. - Fell trees harvested within RCAs directionally away from stream channels and SAFS unless otherwise recommended by a hydrologist or biologist. Fall	**Regional BMPs** 1-4 Using Sale Area Maps and/or ProjectMaps for Designating Water Quality Protection Needs 1-8 Streamside Zone Designation 1-18 Meadow Protection During Timber Harvesting 1-19 Streamcourse and Aquatic Protection 5-3 Tractor Operation Limitations in Wetlands and Meadows 7-3 Protection of Wetlands **National Core BMPs** Aq Eco-2 Operations in Aquatic Ecosystems

Management Requirements	BMPs/Forest Plan[1]/Locations
hazards trees that cannot be removed either parallel to the contour of the slope or into the channel, as recommended by a hydrologist or biologist. - Maintain 75% well distributed ground cover within 100 feet of perennial and intermittent streams and SAFs and 50 feet of ephemeral streams, 60% in the rest of the RCA. - Operate mechanical equipment on a straight-in and straight-out pattern and minimize operations and turning within the RCA. - For meadow encroaching conifer treatment, mechanized equipment exclusion zones for special aquatic features described above apply. Mechanical harvesters must remain 15 feet outside of meadow and reach in to remove encroaching conifers. All encroaching conifers outside of reach of mechanical harvesters may be manually felled.	Plan-3 Aquatic Management Zone Planning Veg-1 Vegetation Management Planning Veg-2 Erosion Prevention and Control Veg-3 Aquatic Management Zones Veg-4 Ground-Based Skidding and Yarding Operations **Forest Plan S&Gs** 189 (RCO 2) 190 (RCO 3) 190 (RCO 4) 191 (RCO 5) **Locations:** All units containing RCAs and SAFs
Road Construction and Reconstruction - Maintain erosion-control measures to function effectively throughout the project area during road construction and reconstruction. - Stabilize disturbed areas with mulch, erosion fabric, vegetation, rock, large organic materials, engineered structures or other measures according to designs and contract specifications. - Minimize diversion potential by installing diversion prevention dips that can accommodate overtopping runoff. Place diversion prevention dips downslope of crossing, rather than directly over crossing fill, and in a location that minimizes fill loss in the event of overtopping. Armor diversion prevention dips when the expected volume of fill loss is significant. - Keep erosion control measures sufficiently effective during ground disturbance to allow rapid closure when weather conditions deteriorate. - Complete all necessary stabilization prior to precipitation that could result in surface runoff. - Scatter construction-generated slash on disturbed areas. Ensure ground contact between slash and disturbed slopes. Windrow slash at the base of fills to reduce sedimentation. Ensure windrows are placed along contours with ground contact between slash and disturbed slope. - Do not construct temporary roads within ¼ mile of an eligible Wild and Scenic River.	**Regional BMPs** 2-2 General Guidelines for the Locationand Design of Roads 2-3 Road Construction and Reconstruction 2-8 Stream Crossings 2-13 Erosion Control Plans **National Core BMPs** Road-3 Road Construction and Reconstruction Veg-2 Erosion Prevention and Control **Forest Plan S&Gs** 58-59 189 (RCO 2) 190 (RCO 4) **Locations**: All temporary roads to be constructed and all permanent roads to be reconstructed.
Road Maintenance and Operations - Clean ditches and drainage structure inlets only as often as needed to keep them functioning. Prevent unnecessary or excessive vegetation disturbance and removal on features such as swales, ditches, shoulders, and cut and fill slopes. - Maintain road surface drainage by removing berms, unless specifically designated otherwise - Adjust surface drainage structures to minimize hydrologic connectivity by: discharging road runoff to areas of high infiltration and high surface	**Regional BMPs** 2-4 Road Maintenance and Operations 2-13 Erosion Control Plans **National Core BMPs** Road-4 Road Operations and Maintenance Veg-2 Erosion Prevention and Control **Forest Plan S&Gs**

Management Requirements	BMPs/Forest Plan[1]/Locations
roughness; armoring drainage facility outlet as energy dissipater and to prevent gully initiation; and increasing the number drainage facilities within RCAs. - Accompany grading of hydrologically connected road surfaces and inside ditches with erosion and sediment control installation. - Divert springs across roads to prevent them from pooling and diverting on or along the road. A layer of coarse rock with geotextile fabric or other treatments may be necessary. - Ensure that after road maintenance activities (i.e., grading/earthwork activities) the final road surface drainage system will remove water from the road surface with the purpose to minimize concentrated runoff to an area. - Conduct road watering for road maintenance, dust abatement, and road surface protection using approved existing water source locations.	189 (RCO 2) 190 (RCO 4) **Locations**: All roads with maintenance orproject use.
Road Closure/Storage - Block road to prevent vehicle access - Ensure road is effectively drained (e.g., waterbars, dips, outsloping) and treated to return the road prism to near natural hydrologic function. - Remove road stream crossings and other culverts identified at high risk of failure and posing a threat to water quality before a road is closed. - Ensure all culverts or other hydrologically connected drainage structures are cleaned and erosion controls are intact and functioning prior to closure.	**Regional BMPs** 2-6 Road Storage 2-13 Erosion Control Plans **National Core BMPs** Road-6 Road Storage and Decommissioning Veg-2 Erosion Prevention and Control **Forest Plan S&Gs** 54 189 (RCO 2) **Locations**: All roads closed post-project or ML 1 status
Decommissioning of Temporary Roads - Decommission temporary roads at the completion of their intended use. - Remove crossing structures and restore stream channels and natural hillslope drainage. - Ensure road is effectively drained (e.g., waterbars, dips, outsloping) and treated to return the road prism to near natural hydrologic function. - Block road to prevent vehicle access. - Treat and stabilize road surfaces through subsoiling, scattering slash, and/or revegetation. Reshape and stabilize side slopes as needed.	**Regional BMPs** 2-7 Road Decommissioning 2-13 Erosion Control Plans **National Core BMPs** Road-6 Road Storage and Decommissioning Veg-2 Erosion Prevention and Control **Forest Plan S&Gs** 59 189 (RCO 2) **Locations**: All temporary roads
Stream Crossings **Design of New or Reconstructed Crossings** - Locate and design crossings to minimize disturbance to the waterbody. Use structures appropriate to the site conditions and traffic. Favor armored fords for streams where vehicle traffic is seasonal or temporary, and where the ford design maintains the channel pattern, profile and dimension. - Install stream crossings according to project specifications and drawings. Design should sustain bankfull dimensions or width, depth, and slope, and	**Regional BMPs** 2-8 Stream Crossings 2-13 Erosion Control Plans **National Core BMPs** AqEco-2 Operations in Aquatic Ecosystems Road-7 Stream Crossings Veg-2 Erosion Prevention and Control

Management Requirements	BMPs/Forest Plan[1]/Locations
maintain streambed and bank resiliency. - Construct diversion prevention dips to accommodate overtopping of runoff if diversion potential exists. Locate diversion prevention dips downslope of the crossing rather than directly over crossing fill; armor diversion prevention dips based on soil characteristics and risk. Install cross drains (e.g., rolling dips, waterbars) to hydrologically disconnect the road above the crossing and to dissipate concentrated flows. **Construction, Reconstruction and Maintenance Operations** - Keep excavated materials out of channels, floodplains, wetlands and lakes. Install silt fences or other sediment- and debris-retention barriers between the waterbody and construction material stockpiles and wastes. Dispose of unsuitable material in approved waste areas outside of the RCA. - Inspect and clean equipment; remove external oil, grease, dirt and mud and repair leaks prior to unloading at site. Inspect equipment daily and correct identified problems before entering streams or areas that drain directly to waterbodies. Remove all dirt and plant parts to ensure that noxious weeds and aquatic invasive species are not brought to the site. - Remove all project debris from the stream in a manner that will cause the least disturbance. - Minimize streambank and riparian area excavation during construction. Stabilize adjacent disturbed areas using mulch, retaining structures, and/or mechanical stabilization materials. - Ensure imported fill materials meet specifications and are free of toxins and invasive species. - Divert or dewater stream flow for all live streams or standing water bodies during crossing installation.	**Forest Plan S&Gs** 59 189 (RCO 2) **Locations:** All stream crossings
Log Landings - Re-use log landings to the extent feasible. Existing landings within RCAs may be used when sedimentation effects can be mitigated by erosion control measures. - Do not construct new landings within 100 feet of perennial or intermittent streams and SAFs or 50 feet of ephemeral streams. - Stabilize landings (e.g., subsoiling, waterbars, outsloping, back-blading, etc.) after use and prior to storm events to prevent off-site movement of sediment. - See the Soils Report for subsoiling requirements.	**Regional BMPs** 1-12 Log Landing Location 1-16 Log Landing Erosion **National Core BMPs** Veg-2 Erosion Prevention and Control Veg-6 Landings **Forest Plan S&Gs** 190 (RCO 4) **Locations**: A ll landings.
Skid Trails - Locate skid trails at least 50 feet from perennial and intermittent streams and SAFs and 25 feet from ephemeral streams. - Use existing skid trails wherever possible, except where unacceptable resource damage may result. Consult a watershed specialist before using an existing skid trail between the 15- and 50-feet zone. - Locate and design skid trails to best fit the terrain, volume, velocity, concentration, and direction of runoff water in a manner that would minimize erosion and sedimentation. - Do not exceed 2 stream crossings per mile along perennial or intermittent	**Regional BMPs** 1-10 Tractor Skidding Design 1-17 Erosion Control on Skid Trails **National Core BMPs** Veg-2 Erosion Prevention and Control Veg-4 Ground-Based Skidding and YardingOperations **Forest Plan S&Gs** 190 (RCO 4) **Locations**: All ground-based yarding

Management Requirements	BMPs/Forest Plan[1]/Locations
streams. - Do not exceed 3 stream crossings per mile along ephemeral streams. - Design skid trail crossings to be perpendicular to the stream channel. - Install waterbars and other erosion control measures as needed on skid trails immediately following completion of timber operations and prior to storm events. - Remove skid trails berms that concentrate flows to improve surface drainage following use. - See Soils Report for additional requirements on rehabilitating skid trails.	system units.
Water Sources - For water drafting on fish-bearing streams: do not exceed 350 gallons per minute for streamflow greater than or equal to 4.0 cubic feet per second (cfs);do not exceed 20 percent of surface flows below 4.0 cfs; and cease drafting when bypass surface flow drops below 1.5 cfs. - For water drafting on non-fish-bearing streams: do not exceed 350 gallons per minute for streamflow greater than or equal to 2.0 cfs; do not exceed 50 percent of surface flow; and cease drafting when bypass surface flow drops below 10 gallons per minute. - Treat road approaches and drafting pads to prevent sediment production and delivery to a watercourse or waterhole. Armor road approaches as necessary from the end of the approach nearest a stream for a minimum of 50 feet, or to the nearest drainage structure (e.g., waterbar or rolling dip) or point where road drainage does not drain toward the stream. - Armor areas subject to high floods to prevent erosion and sediment delivery to water courses. - Install effective erosion control devices (e.g., gravel berms or waterbars) where overflow runoff from water trucks or storage tanks may enter the stream. - Use screening devices for water drafting pumps. Use pumps with low entry velocity to minimize removal of aquatic species, including juvenile fish, amphibian egg masses and tadpoles, from aquatic habitats. - Check all water-drafting vehicles daily and repair as necessary to prevent leaks of petroleum products from entering RCAs. Water-drafting vehicles shall contain petroleum-absorbent pads, which are placed under vehicles before drafting. Water-drafting vehicles shall contain petroleum spill kits. Dispose of absorbent pads according to the Hazardous Response Plan.	**Regional BMPs** 2-5 Water Source Development and Utilization **National Core BMPs** WatUses-3 Administrative Water Developments AqEco-2 Operations in Aquatic Ecosystems **Forest Plan S&Gs** 189 (RCO 2) 190 (RCO 4) **Locations**: All water drafting sites.
Slope and Soil Moisture Limitations - See Soils report for specific slope limitations for operation of ground-based equipment. - See Soils report for wet weather operating restrictions.	**Regional BMPs** 5-2 Slope Limitations for Mechanical Equipment Operation 5-6 Soil Moisture Limitations for MechanicalEquipment Operations **National Core BMPs** Veg-2 Erosion Prevention and Control **Forest Plan S&Gs** 57, 156

Management Requirements	BMPs/Forest Plan[1]/Locations
	Locations: All ground-based equipment units
Servicing, Refueling, and Cleaning Equipment and Parking/Staging Areas - Allow temporary refueling and servicing only at approved sites located outsideof RCAs. - Rehabilitate temporary staging, parking, and refueling/servicing areas immediately following use. - Provide a Spill Prevention Control and Countermeasures (SPCC) plan on all projects as per the contract. Review and ensure spill plans are up to date. - Report spills and initiate appropriate clean-up action in accordance with applicable State and Federal laws, rules and regulations. The Forest Service's hazardous materials coordinator's name and phone number shall be availableto Forest Service personnel who administer or manage activities utilizing petroleum-powered equipment. - Remove contaminated soil and other material from NFS lands and dispose of this material in a manner according to controlling regulations. - Install temporary wash sites only in areas where the water and residue can be adequately collected and either filtered on site or conveyed to an appropriate wastewater treatment facility.	**Regional BMPs** 2-10 Parking and Staging Areas 2-11 Equipment Refueling and Servicing **National Core BMPs** Road-9 Parking and Staging Areas Road-10 Equipment Refueling and Servicing Fac-7 Vehicle and Equipment Wash Water **Forest Plan S&Gs** 189 (RCO 1) **Locations**: All designated temporary refueling,servicing, and cleaning sites and parking/staging areas.
Prescribed Fire – Broadcast or Understory - Avoid damage to obligate riparian vegetation (e.g., willows, alders, cottonwoods). - Retain 75% ground cover within 100 feet of perennial streams and 50 feet of intermittent streams. Ground cover is defined as a minimum of one inch of organic litter, slash, duff, or loose rock fragments, as well as living vegetation less than five feet tall. - Avoid high intensity fire in riparian vegetation. Fire may back or flank into the riparian area as long as ground cover requirements are maintained. - Consult Aquatic Biologist or Hydrologist when designing prescribed fire treatments in and around occupied foothill yellow-legged frog and western pond turtle habitat. Occupied habitat is located in the Rose Creek, Dry Meadow Creek, Middle Fork Stanislaus, and Lower South Fork Stanislaus River HUC 6 watersheds. - Prior to or during the development of burn plans, consult Aquatic Biologist or Hydrologist when determining the appropriate role of direct ignition in obligate riparian vegetation. - Do not construct new dozer lines within 100 feet of perennial and intermittent streams or SAFs and 50 feet of ephemeral streams. - Restore constructed fire lines upon completion of prescribed burning and/or prior to each winter when fire lines are exposed to the potential for erosion. - Install waterbars on hand and dozer lines following waterbar spacing guidelines (in Soils Report), re-contour benched trails, and subsoil detrimentally compacted dozer lines.	**Regional BMPs** 6-2 Consideration of Water Quality in Formulating Fire Prescriptions 6-3 Protection of Water Quality from Prescribed Burning Effects **National Core BMPs** Fire-2 Use of Prescribed Fire **Forest Plan S&Gs** 190 (RCO 4) **Locations**: All units that are planned for prescribed fire.

Management Requirements	BMPs/Forest Plan[1]/Locations
Prescribed Fire – Machine and Hand Burn Piles - Place burn piles a minimum of 50 feet away from perennial and intermittent streams and SAFs and 25 feet from ephemeral streams (unless otherwise approved by a watershed specialist). - Locate piles outside aspen root systems and outside areas that may receive runoff from roads. - Minimize effects on soil, water quality, and riparian resources by appropriately planning pile size, fuel piece size limits, spacing, and burn prescriptions in compliance with state or local laws and regulations.	**Regional BMPs** 6-4 Consideration of Water Quality inFormulating Fire Prescriptions 6-5 Protection of Water Quality fromPrescribed Burning Effects **National Core BMPs** Fire-2 Use of Prescribed Fire **Forest Plan S&Gs** 190 (RCO 4) **Locations**: All pile burning areas.
Application of Registered Borate Compound - Follow all State and Federal rules and regulations as they apply to pesticides. - Do not apply fungicide within 10 feet of surface water, when rain is falling, or when rain is likely that day (i.e., National Weather Service forecasts 50% or greater chance).	**Regional BMPs** 5-7 Pesticide Application According to Label Directions and Applicable LegalRequirements 5-11 Streamside Wet Area Protection DuringPesticide Spraying **National Core BMPs** Chem-2 Follow Label Directions Chem-3 Chemical Use Near Waterbodies **Forest Plan S&Gs** 189 (RCO 1) **Locations**: All units with applications in RCAs.
Application of Herbicides to Treat Noxious Weeds - Comply with all label and other applicable legal requirements for herbicide use and cleaning and disposal of pesticide equipment and containers. Incorporate a spill contingency plan into the project safety plan and have on site during herbicide application. - No storage of herbicides in RCAs other than what is carried in the contractor(s) vehicle to complete each day's work. - Mixing and loading will be done in areas where accidental spills will not contaminate streams or other water. Mixing sites will be predetermined by the COR and should be as far from water and on ground as level as possible. - Do not refill herbicide backpacks within 50 feet of any stream with surface water. - No application will be allowed when the following conditions occur: 1) Sustained wind velocity exceeding 6 miles per hour; 2) Raining or rain forecast in the next 24 hours. - Use only aquatic-approved formulations of herbicides in wetlands. - Maintain a 10-ft no-spray buffer on water for backpack applications of non-aquatic herbicide formulations. - Aquatic-approved herbicides may be applied up to the waterline, but not in water. - To the extent feasible, treatment in wetlands and riparian areas will occur during dry season and/or low water levels.	**Regional BMPs** 5-7 Pesticide Application According to LabelDirections and Applicable Legal Requirements 5-11 Cleaning and Disposal of PesticideContainers and Equipment 5-12 Streamside Wet Area Protection DuringPesticide Spraying **National Core BMPs** Chem-2 Follow Label Directions Chem-3 Chemical Use Near Waterbodies Chem-5 Chemical Handling and Disposal **Forest Plan S&Gs** 189 (RCO 1) **Locations**: All units with applications in RCAs.

Management Requirements	BMPs/Forest Plan[1]/Locations
Water Quality Monitoring - Conduct implementation and effectiveness monitoring using the National Core BMP Monitoring Protocols.	**National Core BMPs** Forest Service Policy for Water Quality Management (pg 7) **Forest Plan S&Gs** 60
Cumulative Watershed Effects (CWE) Analysis - Use suitable tools to analyze the potential for cumulative watershed effects (CWE) to occur from the additive impacts of the proposed project and past, present, and reasonably foreseeable future activities on NFS and neighboring lands within the project watersheds.	**Regional BMPs** 7-8 Cumulative Off-Site Watershed Effects **National Core BMPs** Plan-2 Project Planning and Analysis **Forest Plan S&Gs** 60 **Locations**: All activities within the project watersheds will be analyzed.

[1] Forest Plan S&Gs indicate page number from Forest Plan Direction (USDA 2017).

Wild and Scenic Rivers

Affected Environment

Two eligible Wild and Scenic River segments lie within the SERAL project area. To be eligible for inclusion in the National Wild and Scenic Rivers System pursuant the Wild and Scenic Rivers Act, a river segment must be free-flowing and, in combination with its adjacent land area, possess one or more outstandingly remarkable values (ORVs). "Free-flowing" as applied to any river or section of a river means existing or flowing in a natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway. Categories of ORVs, as defined in the Act, include scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (Wild and Scenic Rivers Act, Section 1(b)).

The eligible Wild and Scenic Rivers (WSRs) in the SERAL project area include 1.5 miles of the North/Middle Stanislaus-Clark Flat segment and 10.5 miles of the Sand Bar – NF Stanislaus segment (Table 24). Each of these segments are free-flowing and have one or more ORVs identified which make them unique among rivers of the United States (USDA 2017). The noticeable or distinctive ORVs identified for the two segments located in the SERAL project area are scenic and recreation for the North/Middle Stanislaus – Clark Flat segment and scenic, recreation, and wildlife for the Sand Bar-NF Stanislaus segment (Table 2).

Table 2. WSR segments and ORVs potentially affected by the SERAL proposed actions.

Eligible Wild and Scenic Segment	Preliminary Classification	ORVs	Length (miles)	Project Area within 0.25-mile Buffer (acres)
Stanislaus Segment: North/Middle Stanislaus-Clark Flat	Wild	Scenic; Recreation	1.5	190

MF Stanislaus Segment 12: Sand Bar – NF Stanislaus	Wild	Scenic; Recreation; Wildlife	10.5	3,937

The Stanislaus National Forest Wild and Scenic River Study (USDA, 1991) defines the ORVs for both segments as follows:

Scenic: Outstanding landscape includes a broad, deep and rugged, V-shaped, river-cut canyon through granitics with some meta-sedimentary rocks exposed. The river provides a variety of water forms including rapids, cascades and pools. Vegetation patterns include scattered ponderosa pine and oak woodland.

Recreation: Hiking and fishing are the popular dispersed activities. Access is limited, resulting in a rare opportunity for solitude and non-motorized recreation experiences, below the snow and available all year.

Wildlife (Bald Eagle): Bald eagle winter and potential nesting habitat exists between the river and the rim of the canyon. One of the four nest territories on the Forest. Bald eagles use the river for feeding during winter and early spring and roost on trees along the river.

Eligible WSRs are also assigned a preliminary classification. The preliminary classification of a river found to be eligible is based on the condition of the river and the development level of adjacent lands as they exist at the time of the study. Section 2(b) of the Wild and Scenic Rivers Act specifies and defines three classification categories for eligible rivers: Wild; Scenic; or Recreational. Both of the eligible WSR segments within the SERAL project area are preliminarily classified as Wild.

Indicators and Measures

Acres of Proposed Treatment within ¼ miles buffer of WSR Corridor:

In order to assess the potential for the proposed treatments to impact the characteristics of the eligible wild river segments located within the SERAL project area and diminish their eligibility for future designation, determining the type and quantity of treatments proposed within a quarter-mile buffer of the WSR corridor must be calculated. Doing so will enable a qualitative assessment of the proposed treatments on the ORVs of each WSR segment.

The acres of proposed treatments within ¼ mile of the WSR corridors are calculated for each treatment type: forest thinning: harvest (sawlog and/or biomass removal via helicopter, skyline, or tractor), understory and surface fuel reduction (mastication or machine piling; this encompasses both forest thinning: other mechanical and fuel reduction, as described in Chapter 2 of the EIS), and prescribed fire only. The construction and maintenance of the fuelbreak network requires a combination of treatments, most of which overlap with other timber/fuels treatments (i.e., forest thinning: harvest). Therefore, for this analysis, the shaded fuelbreak treatment acres are combined with the other like timber/fuels treatments. The exception is the addition of the hand pile and burn treatment for areas of steep slopes on fuelbreaks, which is calculated and reported separately, as it is not proposed as part of the other treatment types.

No salvage of insect-, disease-, or drought-killed trees (within ¼ mile of maintenance level 2-5 roads) or fire salvage (up to 500 acres/watershed) would occur within the ¼-mile WSR buffer. Of all existing maintenance level 2-5 roads, Forest Road 4N85 gets the closest to the ¼-mile WSR buffer. This road is approximately 430 feet outside of the buffer. Any insect-, disease-, drought-, or fire-killed trees within the WSR ¼-mile buffer would not pose a safety hazard to this road or any other road that is located even further away. Therefore, no future roadside hazard tree abatement would occur within the WSR ¼-mile buffer.

Water Quality Assessment:

A qualitative assessment of water quality is needed to determine if water quality in the eligible Wild and Scenic River segments can be maintained under the action alternatives.

Qualitative Assessment of the Impacts of the ORVs of each WSR Segment:

A qualitative assessment of treatments proposed within each eligible WSR segment is needed to determine the impacts to the ORVs and if any of the action alternatives would diminish the eligibility of the segment to be designated in the future.

Free-Flowing Condition Assessment:

A qualitative assessment of the free-flowing condition is needed to determine if any of the action alternatives would impact the free-flowing condition of the river segments.

Direct and Indirect Effects

Table 31. Proposed treatments in WSR ¼ mile buffers

Proposed Treatment Within WSR		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Acres of Proposed Treatment within ¼ mile buffer of W&S River Corridor- N/MF Stanislaus – Clark Flat	Forest Thinning - Helicopter	0	0	0	0
	Forest Thinning - Skyline	0	0	0	0
	Forest Thinning - Tractor	0	0	0	0
	Understory and Surface Fuel Reduction	8	0	8	8
	Prescribed Fire Only	166	0	166	166
	Hand Pile and Burn	11	0	11	11
	Salvage	0	0	0	0
	Hazard Tree Abatement	0	0	0	0
Acres of Proposed Treatment within ¼ mile buffer of W&S River Corridor - MF Stanislaus – Sand Bar – NF Stanislaus	Forest Thinning - Helicopter	144	0	6	6
	Forest Thinning - Skyline	3	0	0	0
	Forest Thinning - Tractor	6	0	0	0
	Understory and Surface Fuel Reduction	14	0	19	14
	Prescribed Fire Only	2,167	0	2,310	2,315
	Hand Pile and Burn	5	0	5	5
	Salvage	0	0	0	0
	Hazard Tree Abatement	0	0	0	0

Water Quality

Maintaining high water quality is needed to maintain the WSR values of the North/Middle Stanislaus-Clark Flat segment and the Sand Bar – NF Stanislaus segment. As seen in Table 3, proposed treatments within the ¼ mile buffer of both eligible WSR segments are dominated by prescribed fire, with 90-99% of treatment acres proposed as prescribed fire only. While some erosion and sedimentation are anticipated to occur as a result of prescribed fire, one of the goals of these treatments is to reduce fuels, and subsequently reduce the likelihood of future stand-replacing wildfire. Stand-replacing wildfire would have much larger water quality impacts than prescribed fire, as prescribed fires do not consume extensive areas of organic matter. Management requirements are anticipated to further minimize impacts of prescribed fire on water quality.

Forest thinning treatments are proposed in the Sand Bar – NF Stanislaus segment only. Much of the proposed acreage is helicopter logging, which involves hand felling and lifting of trees and is anticipated to result in negligible soil displacement and subsequent sedimentation. While skyline and tractor logging systems are anticipated to have greater ground disturbance than helicopter logging, the small acreage proposed (less than 10 acres combined), as well as implementation of management requirements, are anticipated to minimize water quality impacts to the river.

Understory and surface fuel reduction treatments (mastication and piling) are also minimal, with the largest amount proposed under Alternative 3 in the Sand Bar – NF Stanislaus segment. The small acreage proposed, as well as implementation of management requirements, are anticipated to minimize water quality impacts to the river.

Hand piling and burning is proposed on steeper slopes along fuelbreaks. A total of only 16 acres combined is proposed in both eligible WSR segments. Ground disturbance from hand pile and burn is minimal and, when implemented following management requirements, is anticipated for have minimal water quality impacts.

While some sedimentation could occur as a result of the action alternatives, it is anticipated to be minimal and of short duration and is not expected to affect the long-term beneficial uses and purposes for which these river segments were made eligible.

ORV: Scenic

Proposed activities in the action alternatives would not alter the broad, deep and rugged, V-shaped river or the variety of water forms such as rapids, cascades, and pools. The primary treatment in the ¼-mile buffers is prescribed fire. Prescribed fire is being used to return areas where fires have historically been suppressed to their natural fire recurrence intervals. One of the goals of prescribed fire is to reduce fuel loading, which could help prevent large stand-replacing wildfire. Future stand-replacing wildfire could impact the vegetations patterns for which the WSR segments were made eligible – scattered ponderosa pine and oak woodland. This reintroduction of fire is therefore anticipated to protect scenic values.

ORV: Recreation

Proposed activities in the action alternatives would not affect hunting and fishing opportunities. No temporary road construction would be authorized by the decision, so the opportunity for solitude and non-motorized recreation experiences would not be impacted.

ORV: Wildlife (Bald Eagle)

Proposed activities in the action alternatives would not affect the outstandingly remarkable values (ORVs) to Wildlife: Bald eagles for the Eligible Wild and Scenic Segment: MF Stanislaus Segment 12: Sand Bar – NF Stanislaus. All operations will closely follow the habitat management guidelines established for bald eagles by the National Bald Eagle Management Guidelines. These guidelines limit what types of actives may occur within specific buffer distances in bald eagle territories. Treatment areas will Maintain a Limited Operating Period (LOP) prohibiting mechanical operations within 0.25 mile of activity center points during the breeding season of any known bald eagle nest (January 1 through August 31) as advised following the National Bald Eagle Management Guidelines. Bald eagle winter and potential nesting habitat between the river and the rim of the canyon has a higher probability of existing into the future under the action alternatives (see Terrestrial Wildlife BE) and bald eagles may be expected to continue to use the river for feeding during winter and early spring and roost on trees along the river. Under No Action, there is an increased risk of habitat loss in the long term (see Terrestrial Wildlife BE).

Free-Flowing Condition

Maintaining the free-flowing condition of the North/Middle Stanislaus-Clark Flat segment and the Sand Bar – NF Stanislaus segment is necessary to maintain their WSR values. The treatments proposed under any of the action alternatives (Alternatives 1, 3, and 4) would not affect the existing flow regimes of these rivers, as these actions would not impound, divert, straighten, riprap, or in any way modify the waterway. Constriction of flow is not anticipated as a result of stream crossings, as no temporary roads or stream crossings are proposed within the ¼ mile buffers.

Cumulative Effects - WSR

Past activities within the WSR ¼-mile buffers are limited. The Rose Creek Helicopter Insect Salvage occurred in 1992 and the Sand Bar Flat Prescribed Burn occurred in 2012. Past wildfires include the 1965 Middle Fork Fire, 2001 Darby Fire, and 2009 Knight Fire. Recovery timeframes for these activities/occurrences are such that there are currently no measurable effects from these past activities.

Outside of those proposed in SERAL, future proposed activities are limited to those needed to maintain the FERC facilities in the area. This could include treatments such as thinning, biomass removal, pile burning, mastication, salvage, hazard tree removal, and treatment of noxious weeds on up to 22 acres.

Maintaining the free-flowing condition of the eligible WSR segments is necessary to maintain the WSR values. The past activities described above have not affected the free-flowing condition of the WSR segments. The treatments proposed under Alternatives 1, 3, and 4, as well as other future activities (FERC), would not affect the free-flowing condition of the rivers. Naturally occurring events, such as landslides or trees falling into the river could affect the free-flowing condition, but these natural events would not affect the eligibility of the WSR segments.

Maintaining high water quality is also needed to maintain WSR values. Management requirements have been designed to minimize water quality impacts. This includes requirements such as retaining ground cover during prescribed fires and restoring fire lines following prescribed fires. While some sedimentation could occur as a result of the action alternatives and other future activities (FERC), it is anticipated to be minimal and of short duration and is not expected to affect the long-term beneficial uses and purposes for which the river was made eligible.

The activities proposed in SERAL, in combination with past activities and other future activities (FERC) are not anticipated to impact the ORVs for which the WSR segments were determined to be eligible.

Beneficial Uses of Water: Pesticides

Affected Environment

Thirty (30) species of non-native and invasive plans have been found within the project area. Population sizes vary among the species and the use of herbicides to control or eradicate their occurrences is proposed to occur within these known populations.

Seven herbicides are proposed for use, each selected to eradicate or control one or more invasive non-native plants. The proposed herbicides include: aminopyralid, chlorsulfuron, clethodim, clopyralid, glyphosate, indaziflam, and triclopyr.

Water Quality

Potential water quality impacts of herbicides are assessed based on the probable or reasonably expected concentrations that might be encountered in water following herbicide application. These potential impacts are compared to State Water Quality Objectives and Federal Objectives.

Applicable objectives in the Central Valley Regional Water Quality Control Board Basin Plan include:

1) No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses.

2) Discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses.

3) Pesticide concentrations shall not exceed those allowable by applicable antidegradation policies.

4) Pesticide concentrations shall not exceed the lowest levels technically and economically achievable.

5) Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the Maximum Contaminant Levels (MCL) set forth in California Code of Regulations, Title 22, Division 4, Chapter 15.

Where more than one objective may be applicable, the most stringent objective applies (CVRWQCB 2018). The most stringent numerical objective is to not exceed Maximum Contaminant Levels (MCLs). The California Code of Regulations has set a MCL for glyphosate at 0.7 mg/L. In addition to standards set by the State, the Safe Drinking Water Act requires the Environmental Protection Agency (EPA) to determine safe levels of contaminants in drinking water which do or may cause health problems. EPA has set the MCL for glyphosate at the same level as the State (EPA 2009).

A Human Health and Ecological Risk Assessment was completed by the Syracuse Environmental Research Associates (SERA) for each herbicide proposed for use. The information in these reports is the basis for worksheets which estimate concentrations of herbicide in water for a range of potential scenarios (USDA 2021). If concentration of glyphosate in water do not exceed MCLs under the different scenarios, then numeric water quality objectives are met.

MCLs have not been set in the California Code of Regulations or by the EPA for aminopyralid, chlorsulfuron, clethodim, clopyralid, indaziflam, or triclopyr. The most stringent narrative objective is to "not exceed the lowest levels technically and economically achievable." Since neither the State nor the EPA have established MCLs for these herbicides, as a proxy, the no observed adverse effect concentration (NOAEC) for sensitive aquatic invertebrates is used.

Concentrations of herbicides in water are divided by the NOAEC for sensitive aquatic invertebrates to get the hazard quotient (HQ). If the HQ is greater than 1, then there is the potential for adverse effects to sensitive aquatic invertebrates. If HQ is less than one, then these results, in combination with implementation of management requirements designed to protect water quality, meet the State's narrative objective "not to exceed the lowest levels technically and economically achievable."

The Human Health and Ecological Risk Assessment project worksheets are based on assumptions that are intended to be generally conservative. In addition, they do not consider management requirements, such not applying when rain is forecast, or the likelihood of a 20, 100, or 200-gallon spill into a pond when backpack sprayers typically only carry 4-5 gallons of herbicide. Therefore, estimated herbicide concentrations exceeding the MCL or HQs greater than 1 does not automatically mean that water quality objectives weren't met. It means that further analysis is needed to determine the likelihood of the

modeled scenario, the risk to water quality and beneficial uses, and what management requirements are needed to prevent standards from being exceeded.

Human Health

The Human Health and Ecological Risk Assessments prepared by SERA examine the potential health effects on various groups of people who could be exposed to any of the seven herbicides included for use under the action alternatives. Those potentially at risk fall into two groups: workers and members of the public. Workers include applicators, supervisors and other personnel directly involved in the application of herbicides. The public includes other forest workers, visitors and nearby residents who could be exposed through the drift of herbicide spray, through contact with sprayed vegetation, or by eating or placing in the mouth plant materials, such as berries or shoots growing in or near treated areas, by eating game or fish containing herbicide residues, or by drinking water that contains such residues. Periods of potential exposure could range from minutes or hours for recreationists moving through treated areas to extended amounts of time for residences adjacent to treated areas.

Each risk assessment evaluates the potential human health effects from the use of chemical herbicides by comparing dose based on site-specific herbicide use levels (such as might be received from applying the herbicide [worker doses] or from being near an application site [public doses]) with the United States Environmental Protection Agency (EPA) established human Reference Doses (RfD). The chronic RfD is a level of exposure considered low enough to protect against the effects of lifetime or chronic exposure. The risk assessment also examines the potential for these exposures to cause cumulative effects and effects on sensitive individuals.

Types of possible effects considered in the assessments include acute and chronic systemic effects,cancer and mutations and reproductive effects. General systemic effects could range from nausea and headaches at low doses to organ damage, reproductive problems, birth defects or even death.The risk assessments also consider acute toxic effect from accidental exposure scenarios. For each type of dose assumed for workers and the public, a hazard quotient (HQ) was determined by dividing the dose by the RfD. In general, if the HQ is less than or equal to 1, then the dose is at or below the RfD and the risk of adverse health effects is considered acceptable.

In addition to the SERA risk assessments prepared for each herbicide, herbicide worksheets were prepared that calculate HQs for exposure scenarios based on the proposed application methods and rates, and expected herbicide storage, mixing and handling protocols.

Indicators and Measures

Human Health and Ecological Risk Assessments were conducted for each herbicide proposed for use. Analysis indicators and measures from these risk assessments vary among the proposed herbicides: those used to assess the effects of glyphosate and those used to assess the effects of all other proposed herbicides.

Water Quality – Glyphosate:

Is the Maximum Contaminant Level (MCL) exceeded? Yes or No. The assumption is if the MCL is not exceeded then water quality standards would be met and beneficial uses of water would be protected. If levels exceed the MCL, then further analysis is needed to determine the likelihood of the modeled scenario, the risk to water quality and beneficial uses, and what management requirements are needed to prevent standards from being exceeded. Each of the following will be compared to the MCL:

Peak Expected Environmental Concentration (EEC): The risk assessment estimates a peak EEC - a short-term peak concentration of glyphosate in water (acute exposure).

Chronic Expected Environmental Concentration (EEC): The risk assessment estimates a chronic EEC – a long-term peak concentration of glyphosate in water (chronic exposure).

Accidental Spill into a Pond: The risk assessment estimates the concentration of glyphosate in water under the scenarios of an accidental spill of 20, 100, and 200 gallons into a pond.

Water Quality – All Other Herbicides:

Is the hazard quotient (HQ) greater than 1 for sensitive aquatic invertebrates? Yes or No. Since MCLs are not established, as a proxy, the no observed adverse effect concentration (NOAEC) for sensitive aquatic organisms is used. This is the concentration in water where there are no anticipated adverse effects to sensitive aquatic invertebrates. Modeled concentrations of herbicides in water are divided by the NOAEC to get a hazard quotient (HQ). If the HQ is less than one, then it is assumed that water quality objectives are met and beneficial uses of water are protected. If the HQ is greater than 1, then further analysis is needed to determine the likelihood of the modeled scenario, the risk to water quality and beneficial uses of water, and any management requirements that could mitigate that risk.

The HQ for sensitive aquatic invertebrates will be evaluated for the following scenarios:

Peak Expected Environmental Concentration (EEC): The risk assessment estimates a peak EEC - a short-term peak concentration of herbicides in water (acute exposure).

Chronic Expected Environmental Concentration (EEC): The risk assessment estimates a chronic EEC – a long-term peak concentration of herbicides in water (chronic exposure).

Accidental Spill into a Pond: The risk assessment estimates various scenarios of herbicide spill into a pond.

Human Health – All Herbicides:

Is the hazard quotient (HQ) greater than 1 for human health? Yes or No. The risk assessment estimates a dose for exposure to each herbicide. A hazard quotient (HQ) was calculated by dividing this dose by the human reference dose (RfD) established by the EPA. In general, if the HQ is less than or equal to 1, then the dose is at or below the RfD and the risk of human health effects is considered acceptable. Whether a particular dose is at or below the RfD will be assessed for the following circumstances:

Workers with General Occupational Exposure (Chronic)

Workers with Accidental Exposure (Acute)

General Public with Longer-term Exposure (Chronic)

General Public with Shorter-term Exposure (Acute)

Surfactants and Colorants:

Surfactants improve the activity and penetration of herbicides by reducing surface tension, allowing the herbicide mixture to spread evenly over the surface of vegetation. A colorant is added so that the actual treated area can be readily determined, which eliminates the probability of over-application of herbicides and avoids skips, overlaps and human exposures to recently treated vegetation. A qualitative assessment of their potential water quality impacts will be discussed.

Qualitative Assessment of the Effectiveness of BMPs:

Implementation and effectiveness of BMPs in protecting water quality following herbicide application is monitored annually on the Stanislaus National Forest. Results of past monitoring can be used as an indicator of future BMP effectiveness for the SERAL project.

Direct and Indirect Effects

Table 4. Direct and indirect effects of herbicide use.

Indicator / Measure		Alt 1	Alt 2	Alt 3	Alt 4
Does Peak Expected Environmental Concentration (EEC) Exceed the Maximum Contaminant Level (MCL)	Glyphosate	No		Same as Alt 1.	
Is the Hazard Quotient >1 for Aquatic Invertebrates (sensitive) when Exposed to the Peak Expected Environmental Concentration (Acute)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	No		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Indaziflam	No		Same as Alt 1.	
	Triclopyr	No		Same as Alt 1.	
Does the Chronic Expected Environmental Concentration (EEC) Exceed the Maximum Contaminant Level (MCL)	Glyphosate	No		Same as Alt 1.	
Is the Hazard Quotient > 1 for Aquatic Invertebrates (sensitive) when Exposed to the Longer-term Expected Environmental Concentration (Chronic)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	No		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Indaziflam	No		Same as Alt 1.	
	Triclopyr	No		Same as Alt 1.	
Does Accidental Spill into a Pond Exceed the Maximum Contaminant Level (MCL)	Glyphosate	Yes		Same as Alt 1.	
Is the Hazard Quotient >1 for Aquatic Invertebrates (sensitive) when Exposed to an Accidental Spill in a Pond (Acute)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	Yes		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Indaziflam	Yes		Same as Alt 1.	
	Triclopyr	No		Same as Alt 1.	
Is the Hazard Quotient >1 for Workers with General Occupational Exposure (Chronic)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	Yes		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Glyphosate	No		Same as Alt 1.	
	Indaziflam	Yes		Same as Alt 1.	
	Triclopyr	Not reported		Same as Alt 1.	
Is the Hazard Quotient >1 for Workers with Accidental Exposure (Acute)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	Yes		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	

	Glyphosate	No		Same as Alt 1.	
	Indaziflam	No		Same as Alt 1.	
	Triclopyr	Not reported		Same as Alt 1.	
Is the Hazard Quotient >1 for the General Public with Longer-term Exposure (Chronic)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	Yes		Same as Alt 1.	
	Clethodim	No		Same as Alt 1.	
	Clopyralid	Yes		Same as Alt 1.	
	Glyphosate	No		Same as Alt 1.	
	Indaziflam	Yes		Same as Alt 1.	
	Triclopyr	Yes		Same as Alt 1.	
Is the Hazard Quotient >1 for the General Public with Shorter-term Exposure (Acute)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	No		Same as Alt 1.	
	Clopyralid	Yes		Same as Alt 1.	
	Glyphosate	No		Same as Alt 1.	
	Indaziflam	No		Same as Alt 1.	
	Triclopyr	Yes		Same as Alt 1.	

Discussion below addresses all "yes" answers above in Table 36 for Alternatives 1 and 3. Further analysis is needed on all "yes" answers to determine the likelihood of the modeled scenario, the risk to water quality and beneficial uses of water, the risk to human health for workers and the general public, and any management requirements that could mitigate that risk.

Water Quality

Glyphosate:

The scenario of an accidental spill into a pond exceeds the MCL for glyphosate. The scenarios modeled included spills of 20 gallons, 100 gallons, and 200 gallons into a pond. A spill of 20 gallons into a pond does not exceed the MCL, but the 100-gallon and 200-gallon spills do exceed the MCL. For SERAL implementation, the treatment with highest risk of spill/largest quantity of herbicide carried is application with a backpack sprayer. Backpack sprayers typically carry 4 or 5 gallons of herbicide. Twenty to 25 full backpacks would have to fail and spill in a pond to meet the 100-gallon spill scenario where the MCL was exceeded. Therefore, even in the case of accidental spill, it is unlikely that MCLs would be exceeded for glyphosate. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of glyphosate.

Aminopyralid:

The HQ was not greater than 1 under any of the water quality scenarios evaluated for aminopyralid. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of aminopyralid.

Chlorsulfuron:

The HQ was not greater than 1 under any of the water quality scenarios evaluated for chlorsulfuron. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of chlorsulfuron.

Clethodim:

The HQ was greater than 1 under the scenario of an accidental spill into a pond. The scenarios modeled were 20-gallon, 100-gallon, and 200-gallon spills. Sensitive aquatic invertebrates had a HQ greater than 1

for the 100- and 200-gallon spills only. As described for glyphosate, high quantity spills into a stagnant waterbody are very unlikely when backpack sprayers carry only 4-5 gallons at a time. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of clethodim.

Clopyralid:

The HQ was not greater than 1 under any of the water quality scenarios evaluated for clopyralid. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of clopyralid.

Indaziflam:

The HQ was greater than 1 under the scenario of an accidental spill into a pond. The scenarios modeled were 20-gallon, 100-gallon, and 200-gallon spills. Sensitive aquatic invertebrates had a HQ greater than 1 for the 200-gallon spill only. As described for glyphosate, high quantity spills into a stagnant waterbody are very unlikely when backpack sprayers carry only 4-5 gallons at a time. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of indaziflam.

Triclopyr:

The HQ was not greater than 1 under any of the water quality scenarios evaluated for triclopyr. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of triclopyr.

Human Health

Glyphosate:

The HQ was not greater than 1 under any of the human health assessments for glyphosate. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of glyphosate.

Aminopyralid:

The HQ was not greater than 1 under any of the human health assessments for aminopyralid. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of aminopyralid.

Chlorsulfuron:

The HQ was greater than 1 under the scenario of longer-term chronic exposure of chlorsulfuron to the general public. The exceedance was specifically for an adult female consuming contaminated vegetation (chronic). The likelihood of an adult female repeatedly consuming contaminated vegetation following noxious weed treatment in SERAL is unlikely. This scenario is more applicable to uses of chlorsulfuron in agricultural settings than treatment of small populations of noxious weeds. In addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of chlorsulfuron.

Clethodim:

The HQ was greater than 1 for both the acute and chronic exposures of workers. These exceedances are when a worker wears contaminated gloves for an hour (acute exposure) or has extended general exposure (chronic) to the highest application volume analyzed. The acute exposure scenario can be mitigated by washing contaminated hands and replacing contaminated gloves, as described in the management requirements. The chronic exposure modestly exceeds the level of concern (HQ = 1.3). The analysis report associated with the calculations (USDA 2021) states that this level of exposure for workers would, "most likely reflect adverse conditions during the application (e.g., rough terrain) and/or poor worker

practices in terms of limiting exposure", and that an "HQ of about 1.7 would be viewed with clear concern." Management requirements were designed to minimize exposure. This includes wearing proper personal protective equipment (PPE), providing soap and clean water on site, and only applying when conditions are suitable. Therefore, if good worker practices are used to limit exposure, it is unlikely that human health standards for workers or the general public would be exceeded under the proposed use of clethodim.

Clopyralid:

The HQ was greater than 1 for the general public under the scenario of water consumption by a child following an accidental spill into a pond of 200 gallons of clopyralid. As described for glyphosate, high quantity spills into a stagnant waterbody are very unlikely when backpack sprayers carry only 4-5 gallons at a time. In addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is therefore highly unlikely that this risk to the general public exists.

The HQ was also greater than 1 for the general public under the scenario of an adult female consuming contaminated vegetation (chronic). The likelihood of an adult female repeatedly consuming contaminated vegetation following noxious weed treatment in SERAL is unlikely. This scenario is more applicable to use of clopyralid in agricultural settings than treatment of small populations of noxious weeds. In addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of clopyralid.

Indaziflam:

The HQ was greater than 1 for workers with general occupational exposure (chronic). The chronic exposure modestly exceeds the level of concern (HQ = 1.8). The analysis report associated with the calculations (USDA 2021) states that "these HQs are relatively modest exceedances in the level of concern and do not raise substantial concern." Management requirements were designed to minimize exposure. This includes wearing proper personal protective equipment (PPE), providing soap and clean water on site, and only applying when conditions are suitable. These management requirements are anticipated to further mitigate concerns.

The HQ was greater than 1 for the general public under the scenario of an adult female consuming contaminated vegetation (chronic). The likelihood of an adult female repeatedly consuming contaminated vegetation following noxious weed treatment in SERAL is unlikely. This scenario is more applicable to use of indaziflam in agricultural settings than treatment of small populations of noxious weeds. In addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of indaziflam.

Triclopyr:

The worksheets for triclopyr cover the TCP metabolite of triclopyr. Because it is the metabolite and not the actual chemical applied, there are no worksheets related to worker exposure.

The HQ was greater than 1 for the general public under the scenarios of an adult female consuming contaminated vegetation or contaminated fruit (both acute and chronic). The likelihood of an adult female consuming contaminated vegetation or fruit following noxious weed treatment in SERAL is unlikely. This scenario is more applicable to use of triclopyr in agricultural settings than treatment of small populations of noxious weeds. In addition, sites that are treated with herbicides have signs posted

to warn the general public that spraying has recently occurred. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of triclopyr.

Herbicide Surfactants and Colorants

Syl-tac™:

Syl-tac™ is a surfactant that is proposed for use as an additive during herbicide application. It has a Caution signal word and may cause slight skin and eye irritation. Syl-tac™ is a mixture of the following two products: Hasten® and Sylgard® 309.

Hasten® has a Caution signal word. It may be irritating to the skin and to the eyes. The main ingredient in Hasten® contained in the Syl-tac™ product is esterified canola seed oil. The MSDS lists isopropylamine as a hazardous ingredient at levels of 2 percent in the formulation (Bakke 2007).

Sylgard® 309 has a Warning signal word. It is considered slightly irritating to the skin and is considered severely irritating to the eyes. It is not a skin sensitizer. The MSDS describes a 28-day oral dosing study in rats, in which rats were fed doses of 0, 33, 300, or 1,000 mg/kg/day. No significant findings of biological relevance were seen in females, while males showed some effects at highest dose (body weight gain, and changes in food consumption). This would indicate a subchronic NOEL of 300 mg/kg/day (Bakke 2007).

The rainbow trout 96-hr LC50 for Syl-tac™ is >5mg/L. The daphnia 48-hr EC50 for Syl-tac™ is also >5mg/L (Bakke 2007). According to the Syl-tac™ label, the product should not exceed 5 percent of the finished spray volume. The project is proposing to use for Syl-tac (0.4 percent). Due to the small amount of surfactant being used, it is unlikely that these toxicity levels would be exceeded.

Hi-Light™ Blue:

Hi-Light™ Blue is a water-soluble dye that contains no toxic chemicals (USDA 2021). It is mildly irritating to the skin and eyes. It is considered to be virtually non-toxic to humans. Its effect on non-target terrestrial and aquatic species is unknown, however its use has not resulted in any known problems (Bakke 2007). The dye used in Hi-Light™ Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds (USDA 2021).

Colorfast™ Purple:

Colorfast™ Purple is a water-soluble dye that contains no toxic chemicals (USDA 2021). It is mildly irritating to the skin, but, because of the acetic acid content, can be severely irritating to the eyes and can cause permanent damage. Acetic acid is the ingredient in household vinegar, although household vinegars are typically 4-10 percent acetic acid and Colorfast™ Purple contains 23.4 percent by weight. Colorfast™ Purple contains gentian violet, which is a common laboratory reagent and stain. This dye is commonly used as an antifungal or antibacterial medication for dermal or mucous membrane infections (USDA 2021).

BMP Effectiveness:

The Stanislaus National Forest has utilized herbicides for treatment of noxious weeds as well as for reforestation purposes. Reforestation activities utilize much larger quantities of herbicides than those proposed for noxious weeds, as noxious weed populations are often much smaller and isolated populations, compared to large-scale site prep or release with herbicides in reforestation. Therefore, effectiveness of BMPs during reforestation activities can indicate the likelihood of success of BMPs for smaller noxious weed projects.

Monitoring has been conducted by the Stanislaus National Forest on reforestation herbicide treatments. The most recent monitoring was completed for BMP implementation and effectiveness for Rim Reforestation following the National Core BMP Evaluation Protocol in 2018, 2019, and 2021. Monitoring indicated that BMPs were fully implemented and were effective at all three sites, resulting in composite scores of excellent. In addition, all Rim Reforestation units that were treated with herbicides have a BMP checklist that is filled out by the project lead, documenting whether BMPs were implemented as planned in the Rim Reforestation NEPA. Between 2018 and 2020, BMP checklists were completed for 82 units, and all applicable BMPs were implemented as planned. Based on this track record of implementing BMPs on the ground and monitoring results showing that implemented BMPs were effective at protecting water quality, it is assumed that BMPs proposed for SERAL will be implemented and effective at protecting water quality and human health and safety.

Cumulative Effects - Herbicides

Past noxious weed treatments within the SERAL project watersheds are limited. Previous activities include 8 acres of herbicide treatment in the Dry Meadow watershed, 69 acres of herbicide treatment in the Middle South Fork Stanislaus River watershed, and 41 acres of herbicide treatment in the Stony Gulch watershed.

There is the potential for future herbicide treatments within the SERAL project watersheds outside of those proposed for the SERAL project on private land (noxious weeds and/or reforestation) or within FERC boundaries (noxious weeds). It is estimated that up to approximately 2,000 acres could be treated.

There are unlikely to be cumulative impacts of previous herbicide treatments when combined with proposed treatments under SERAL and potential future herbicide treatments outside of those proposed for SERAL. Modeling indicated low risk to human health and water quality. In addition, evaluations of implementation and effectiveness of BMPs on much larger herbicide treatments for reforestation projects indicate that BMPs for herbicide treatments are typically implemented as planned and effective. Therefore, cumulative effects of herbicide treatments on water quality and human health are not anticipated.

Beneficial Uses of Water: Sediment and Temperature

Affected Environment

Activities proposed under the SERAL action alternatives span eleven HUC 6 watersheds (also referred to as 12-digit HUC watersheds). These include:

- Cow Creek-Middle Fork Stanislaus River
- Dry Meadow Creek-Middle Fork Stanislaus River
- Middle South Fork Stanislaus River
- Rose Creek
- Lower South Fork Stanislaus River
- Stony Gulch-Stanislaus River
- Upper North Fork Tuolumne River
- Upper South Fork Stanislaus River
- Griswold Creek
- Sullivan Creek
- Mill Creek-Middle Fork Stanislaus River

Elevations in the project area range from 7,840 feet in the north-east end of the project area at Bull Run Rock, to 920 feet at the southwest end of the project area at the confluence of the Stanislaus River and the South Fork Stanislaus River. Vegetation is primarily composed of yellow pine/dry mixed conifer, oak woodland, shrub, and fir/moist mixed conifer. Bedrock geology is dominated by granitics and metasedimentary rock, with some volcanics.

Mean annual precipitation ranges from 35-55 inches and falls as rain in the lower elevations and rain and snow in the higher elevations. A large proportion of the land in the project watersheds is within the rain-on-snow zone, which is found from approximately 4,500-6,500 feet elevation. Long-duration rain falling on shallow snowpack in this zone can produce high peak flows.

Riparian Conservation Areas (RCAs) are corridors along stream channels and surrounding meadows, springs, and other wetland areas that provide habitat for plants that thrive on a high water table. These riparian obligate species include alders, big leaf maples, dogwoods, cottonwoods, aspens, willow, and a variety of streamside and meadow herbaceous plants. Conifers also co-exist in RCAs with obligate species, often growing well near streams.

Vegetation is a critically important watershed component. It shades the soil to hold moisture, inputs organic matter which builds the soil, and provides cover that minimizes erosion and stream sedimentation. It provides shade that maintains cool stream temperatures. It also helps store water in the soil by intercepting precipitation, thus reducing excessive runoff and maintaining high water quality.

The Stanislaus National Forest developed operational requirements for mechanized equipment operations in RCAs in 2006 (Frazier 2006). These operational requirements were intended to meet fuel reduction and forest health objectives while protecting water quality and maintaining or improving riparian area condition. Many riparian areas on the forest, including areas in SERAL, have a high fire hazard as a result of past exclusion of fire and/or limiting of fuel reduction and forest health treatments in near-stream areas. Fuel reduction, forest health treatments, and re-introduction of low-intensity fire (prescribed fires) in RCAs are critical to minimize the risk of stand-replacing wildfire. Wildfire resulting from a high fire hazard in riparian areas is usually a greater threat to water quality and riparian habitat than impacts from carefully designed management activities intended to reduce the hazard.

Indicators and Measures

Acres of Proposed Treatments within RCAs:

In order to assess the potential for the proposed treatments to impact sediment and temperature, determining the type and quantity of proposed treatments in RCAs must be calculated. Doing so will enable a qualitative assessment of the proposed treatment activities on beneficial uses of water related to sediment and temperature.

Qualitative Assessment of the Effectiveness of BMPs:

Implementation and effectiveness of BMPs in protecting water quality is monitored annually on the Stanislaus National Forest since 2002 following regional protocols (USDA 2002). Monitoring began shifting from following regional protocols to following newly developed national protocols in 2014 (USDA 2012). Results of past monitoring can be used as an indicator of future BMP effectiveness for the SERAL project.

Qualitative Assessment of Monitoring Requirements:

A discussion of the planned monitoring associated with the SERAL project will display the role monitoring plays in ensuring that BMPs and management requirements are implemented and effective.

Qualitative Assessment of the Impacts of Proposed Activities on Sediment and Temperature:

A qualitative assessment of the impacts of the treatments on sediment and temperature is needed to determine if beneficial uses of water related to sediment and temperature will be maintained under the action alternatives.

Direct and Indirect Effects

RCAs are defined in the Forest Plan Direction as 300 feet on each side of perennial streams, 150 feet on each side of seasonally flowing streams, and 300 feet from the edge of special aquatic features (SAFs), such as meadows, lakes, and ponds (USDA 2017). Proposed treatments within RCAs are shown by alternative in Table 5. Due to inaccuracies in mapping of ephemeral stream channels, calculations of treatment acres for seasonally flowing streams included intermittent channels only.

Table 5. Acres of proposed treatments within RCAs under each alternative

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Acres of Forest Thinning - Helicopter	321	0	66	30
Acres of Forest Thinning - Skyline	255	0	65	57
Acres of Forest Thinning - Tractor	5,108	0	2,754	1,264
Acres of Understory and Surface Fuel Reduction (mastication and machine piling)	2,377	0	4,402	5,756
Acres of Prescribed Fire Only	3,531	0	3,709	3,715
Acres of Hand Pile and Burn	125	0	125	125
Acres of Potential Fire Salvage*	<3,000	0	<3,000	0
Maximum Acres of Potential Insect/Disease/Drought Salvage**	6,121	0	6,121	0
Maximum Acres of Potential Hazard Tree Abatement***	1,708	0	1,708	0
Estimated Miles of Temp Road >300 feet in Length****	<26.0	0	<14.6	<6.0

*Potential Fire salvage is 500 acres/watershed or 3,000 acres total under Alternative 1 and 3. Because the future fire location is unknown, it is also unknown how many of the up to 3,000 acres would fall into a RCA.
**Acres of insect-, disease-, or drought-killed trees that could be authorized for harvest in RCAS is based of acres of potential treatment area (on FS lands, within ¼ mile of roads, forested, etc.). This is the maximum amount modeled, and actual amounts would likely be less.
***Acres of potential hazard tree abatement in RCAs is based on acres of potential treatment area (on FS lands, within 150 feet of roads, forested, etc.). This is the maximum amount modeled, and actual amounts would likely be less.
****The total estimated miles of temporary road >300 feet in length for each alternative are reported. However, it is unknown what percentage of this length could be constructed in RCAs. Therefore, the < symbol is used as a way of displaying that the length in RCAs would be less than the total estimated mileage.

Miles of road reconstruction or maintenance is not included in the table, as all roads in the project area could be treated under alternatives 1, 3, and 4, regardless of which action alternative was selected.

BMP Effectiveness:

Monitoring of Timber and Vegetation Management BMPs:

Between 2002 and 2015, BMPs related to timber harvest and vegetation management activities were evaluated for implementation and effectiveness following the regional BMP evaluation protocol at 152 sites on the STF. Evaluations focused on streamside management zones (aka RCAs), skid trails, suspended yarding, landings, timber sale administration, meadow protection, and vegetation management (mastication). BMPs were fully implemented at 97% of the sites evaluated. Of the 152 evaluations, 83% were functioning effectively at preventing off-site movement of sediment while BMPs at only 5% of sites were rated as not effective. Twelve percent of sites were rated "at-risk" of becoming ineffective due to various factors such as marginal BMP implementation or inadequate BMP prescriptions. BMPs rated as at-risk or not effective generally receive follow-up remedial actions and monitoring to mitigate any threat to water quality. A summary of BMP monitoring data across the entire region for the years 2003-2007 found that BMPs related to timber harvest were implemented 90% of the time and had an effectiveness rate of 98% (USDA 2009). Regional data from 2008-2010 had implementation and effectiveness rates for timber harvest activities of 97% and 89% respectively (USDA 2013).

Implementation and effectiveness monitoring of BMPs following the national protocol was conducted from 2014-2021. This protocol gives a composite score (combining both implementation and effectiveness) of excellent, good, fair, or poor for each evaluation conducted. Evaluations focused on ground-based skidding and harvesting, cable or aerial harvesting, and mechanical site treatments (mastication). Of the 22 evaluations completed, 45% were rated as excellent, 23% were good, 9% were fair, and 23% were poor. The sites that were rated as poor did not have fully implemented BMPs. As with the regional BMPs, the national BMPs that were rated poorly generally receive follow-up remedial actions and monitoring to mitigate any threats to water quality.

A study conducted on four National Forests in the Cascades and Sierra Nevada reported that USFS streamside management zones are effective in preventing sediment from timber harvesting units being delivered to streams (Litschert and MacDonald 2009). STF monitoring (following regional and national protocols), regional monitoring data, and the findings of Litschert and MacDonald (2009) all indicate that timber harvest and vegetation management BMPs are effective when implemented.

Monitoring of Prescribed Fire BMPs:

Between 2002 and 2014, 25 BMPs related to prescribed fire were evaluated following the regional BMP evaluation protocol. An additional prescribed fire was evaluated in 2014 using the national BMP evaluation protocol. Of the 25 regional evaluations, 23 were effective, one was at-risk, and one was not effective. Under the national protocol, the composite score of the one evaluation was excellent. A regional summary of BMP monitoring data for the years 2003 to 2007 reported implementation and effectiveness rates of 87% and 100%, respectively, for prescribed fire BMPs (USDA 2009). A regional summary for the years 2008-2010 reported implementation and effectiveness rates of 91% and 96%, respectively (USDA 2013). This monitoring data demonstrates the high rates of implementation and effectiveness of prescribed fire BMPs.

Monitoring of Road Management BMPs:

Between 2002 and 2016, 170 roads were evaluated for BMP implementation and effectiveness under the regional protocol. This included evaluations of road surface, drainage, and slope protection, stream crossings, road decommissioning, control of sidecast materials, servicing and refueling, temporary roads,

water source development, and management of roads during wet periods. Of these, 75% were found to be effective, 16% were found to be at risk, and 9% were not effective. Under the national protocol, the composite score of eight evaluations indicated some issues with erosion and sedimentation, as 50% of the evaluations were rated as excellent, good, or fair, and 50% were rated as poor. A regional summary of BMP monitoring data for the years 2003-2007 reported implementation and effectiveness rates of 88% and 90%, respectively, for road construction/engineering BMPs (USDA 2009). A regional summary for the years 2008-2010 reported implementation and effectiveness rates of 89% and 77%, respectively (USDA 2013). As mentioned previously, sites rated as not effective, at risk, or poor composite scores are generally monitored and remediated to improve BMP deficiencies.

Monitoring Requirements:

Regional and National BMP monitoring:

Region 5 has shifted from implementing BMP monitoring following the regional protocol to BMP monitoring following the national protocol. Each forest is assigned seven national BMP evaluations each year by the Regional Office. Activities in SERAL, such as ground-based skidding and harvesting, cable/aerial yarding, mechanical site treatments, road treatments, and prescribed fire are candidates for monitoring.

Timber General Order:

The Central Valley Regional Water Quality Control Board (Water Board) developed a General Order (GO) for discharges related to timberland management activities for non-federal and federal lands in 2017 (CVRWQCB 2017). Compliance with the Timber GO is needed to meet the requirement of federal and state water laws (i.e., Clean Water Act and Porter-Cologne Water Quality Act). All commercial timber activities proposed in SERAL would be subject to monitoring and reporting requirements of the GO to ensure that the Forest Service is in compliance with all federal and state water laws.

Annual reporting for the Timber GO requires BMP monitoring following the Forest Service national BMP protocol for every project enrolled in the GO that is not post-fire treatments (post-fire has different requirements). The GO also requires collection of data on Significant Existing or Potential Erosion Sites (SEPES). While SEPES data collection covers all erosion sources, due to acknowledgement that most erosion and sedimentation related to timber and fuels activities are associated with roads, SEPES data collection often focuses primarily on road-related erosion and sedimentation. This information on pre-existing (legacy) road erosion sites is presented to the Water Board as part of the Notice of Intent (NOI) application for coverage. Continued monitoring and plans for rectifying road-related erosion is coordinated with the Water Board and results in reduced road-related erosion and sedimentation, as well as other sources of erosion and sedimentation, by the time the Notice of Termination (NOT) for the Timber GO permit is submitted.

Impacts of Proposed Activities on Sediment and Temperature:

Erosion and Sedimentation (Forest Thinning Harvest, Forest Thinning Other Mechanical, Mechanical Fuel Reduction, and Shaded Fuelbreaks):

Monitoring data and research findings have indicated that BMPs are highly effective when implemented on ground-based skidding and harvesting activities. In addition, skyline treatments are designed to reduce potential ground disturbance and thus can mitigate sediment inputs to streams. Helicopter logging systems have even lower potential for ground disturbance and subsequent erosion and sedimentation. Mastication reduces fuel loading, while increasing ground cover, thus minimizing erosion and sedimentation potential. Because of the high rate of BMP implementation and effectiveness for timber

activities, increased erosion and sedimentation that could result from mechanized equipment is expected to be minor and short-term and not adversely affect beneficial uses of water. In addition, the STF has adaptive mechanisms in place to identify and mitigate threats to water quality that may arise from inadequate BMP implementation or other factors.

Vegetation treatments would lower the risk of a high-severity wildfire (Elliot et al. 2010). High-severity wildfire can result in significant (i.e., orders of magnitude) increases in runoff, erosion, and sedimentation that could cause short-term detrimental impacts to water quality and beneficial uses (Neary et al. 2008).

Erosion and Sedimentation (Prescribed Fire and Pile Burning):

Both surface and rill erosion have the potential to increase following fire. This is due to the reduction of vegetative and litter cover that intercepts rainfall. Reduced cover causes the soil surface to become subject to raindrop impact. The increased erosion is related to the amount of vegetation removed. However, prescribed burns, by design, do not consume extensive areas of organic matter (Baker 1990). Prescribed fire is designed to burn at low intensities to retain adequate residual ground cover in order to protect mineral soil from erosion. Therefore, prescribed fires have been shown to have little impact on erosion and sedimentation, whereas intense wildfires may have substantial impacts (Brooks et al. 1997; Elliot et al. 2010).

Although the prescribed fire in the action alternatives would be allowed to burn down towards streams, BMPs are designed to protect water quality and past monitoring has indicated that these BMPs are effective. Approximately 75% of the organic matter is expected to remain within 100 feet of perennial and 50 feet of intermittent streams. In addition, burn piles would be placed 50 feet away from perennial and intermittent streams and 25 feet from ephemeral streams. Research has shown that riparian vegetation traps sediment from side slopes that would otherwise enter the channel if riparian vegetation is not present (Brooks et al. 1997). Since riparian vegetation is not targeted in the SERAL project, any increased erosion from prescribed fire or burn piles has the potential to be filtered out before reaching surface water. The BMPs described above would minimize any actual effects of prescribed fire and pile burning as well as their associated firelines on water resources to a minor or negligible amount.

Prescribed fire and pile burning treatments would lower the risk of high-severity wildfire, which could result in increased runoff, erosion, and sedimentation that could cause short-term detrimental impacts to water quality and beneficial uses (Neary et al. 2008).

Erosion and Sedimentation (Road Treatments):

Road treatments may include road maintenance, reconstruction, temporary road construction, and decommissioning of temporary roads. Road maintenance, reconstruction, and decommissioning would cause temporary ground disturbance. However, these activities would improve drainage on the roads and therefore reduce sediment inputs to streams in the long term. Erosion and sedimentation from temporary road construction is anticipated to be the highest during the first 1-2 years following construction activities, after which time erosion rates sharply decrease (Megahan 1974; Ketcheson and Megahan 1996). These temporary roads would be decommissioned following use, further reducing the potential for erosion and sedimentation. No permanent road construction is proposed under any action alternative.

Chronic and episodic erosion and sedimentation from roads would decrease over the long-term as a result of reducing hydrologically connected road segments identified during collection of SEPES data, and through overall improvements from general maintenance and reconstruction activities. As funding is secured, treatment of legacy road sites that are not being used for timber hauling would be treated as well.

BMPs related to road treatments would be implemented to ensure that any potential adverse effects to water quality would be avoided or minimized to minor and short-term effects. In addition, road erosion and sedimentation would be a focus of SEPES monitoring and reporting to the Water Board.

Stream Temperature:

Stream water temperatures have the potential to increase slightly following vegetation management treatments due to reductions in overstory canopy. This effect would decrease over time as the canopy increases due to tree and shrub growth. For small, forested streams, research has shown that elevated water temperatures resulting from a reduction in shade decrease to pre-disturbance water temperature within 500 feet downstream of the affected reach (Zweiniecki and Newton 1999). Therefore, beneficial uses of water for stream temperature are not anticipated to be adversely affected under the action alternatives.

Management requirements and BMPs are designed to protect riparian vegetation along steam channels. This riparian vegetation provides shading to streams to maintain cool stream temperatures. Although some near-stream conifers are thinned in treatment units, the thinning is intended to accomplish the following: 1) promote growth of riparian vegetation that might be shaded out by conifers, and 2) reduce fuel loading along riparian corridors. As described above, overly dense vegetation along riparian corridors pose a threat to water quality during a high-severity burn, which may result in a large reduction in shade, leading to increased water temperatures.

Cumulative Watershed Effects

Affected Environment

The HUC 6 level watersheds are the most appropriate scale for cumulative watershed effects analysis for the SERAL project. These are sub-watersheds that range in size from 10,000-40,000 acres. The HUC 6 watersheds (also referred to as 12-digit HUC watersheds) are part of the Watershed Boundary Dataset (WBD), a national hydrologic unit dataset. The HUC 6 watersheds are the smallest watersheds delineated for the entire United States. Larger watersheds (HUC 5 or HUC 4) are too large to adequately analyze effects of this project.

Table 6. Hydrologic Unit Code (HUC) 6 Watersheds within the SERAL Project Boundary

HUC 6 Name	HUC 6 Size (acres)	Project Area in HUC 6 (acres)	Percentage of HUC 6
Cow Creek-Middle Fork Stanislaus River	23,015	23,015	100
Dry Meadow Creek- Middle Fork Stanislaus River	29,423	29,281	100
Middle South Fork Stanislaus River	26,261	25,785	98
Rose Creek	27,242	26,372	97
Lower South Fork Stanislaus River	13,765	8,827	64
Stony Gulch-Stanislaus River	10,914	3,304	30
Upper North Fork Tuolumne River	29,639	943	3
Upper South Fork Stanislaus River	28,326	788	3
Griswold Creek	33,084	415	1
Sullivan Creek	24,818	51	0
Mill Creek-Middle Fork Stanislaus River	27,550	27	0

As Table 6 indicates, the project area is primarily located in six HUC 6 watersheds. As a result, the focus of the cumulative watershed effects analysis for this project is on the following watersheds:

- Cow Creek-Middle Fork Stanislaus River
- Dry Meadow Creek-Middle Fork Stanislaus River
- Middle South Fork Stanislaus River
- Rose Creek
- Lower South Fork Stanislaus River
- Stony Gulch-Stanislaus River

The remaining watersheds have such a small percentage of watershed with potential for treatment (3% or less) that the effects of SERAL implementation are unlikely to cause thresholds of concern to be exceeded. Therefore, they are not analyzed further.

Indicators and Measures

The process for analyzing cumulative watershed effects (CWE) consists of two steps: (1) an office evaluation which consists of determining the risk of cumulative effects using a predictive model and researching watershed history, and (2) field evaluation of streamcourse indicators of cumulative effects.

Step 1, the risk of cumulative effects, is evaluated using the Forest Service equivalent roaded acreage (ERA) methodology, which has been adopted by Region 5 as a method of addressing cumulative watershed effects (USDA 2011). ERA values are calculated using a computer model developed on the Stanislaus National Forest (Rutten and Grant 2008). The model is designed as a preliminary indicator for managers to determine whether or not past and present land management disturbances in a given watershed approach or exceed a threshold of concern (TOC). The TOC for each watershed was determined based on the watershed's relief ratio, geology, and precipitation regime. The ERA model is intended to predict risk of cumulative effects, not actual effects. As such, it is an initial screen for focusing field evaluation priorities.

Understanding watershed history (i.e. past management activities, hydrologic events, wildfire) is important to build a temporal context of past impacts, current condition and potential future effects. Analysis of watershed history, including land disturbance history, is essential to help predict effects of future management activities on water quality and watershed condition. This history is considered in the ERA model spreadsheets. The temporal scope analyzed is based upon the estimated time of recovery from each past activity or event. It varies by activity and ranges from 1 to 10 years. The temporal scope for known future activities also varies by activity and ranges from 1 to10 years into the future. Not all future activities used to calculate ERA values have a defined proposed action. Therefore, assumptions were made about when and where activities would likely occur. These assumptions are documented below in the assumptions section.

Step 2, field evaluation, is necessary for comparing the modeled ERA prediction with actual and expected future field conditions. Project-related water quality parameters and watershed condition are evaluated via in-stream and near-stream indicators of condition. This evaluation is essential to help interpret cumulative effects of past projects and potential cumulative effects given proposed activities and other reasonably foreseeable future activities. Field review was used to verify that the geographic and temporal extent of analysis was adequate for evaluation of cumulative watershed effects.

The CWE ERA analysis for the SERAL EIS was conducted on all lands within the affected watersheds (public and private lands). GIS analysis was used to calculate acreages of activities in the watersheds. CalFire Timber Harvest Plans were utilized to determine activities on private land. ERA values for all activities were summed and then were compared to a TOC. These TOCs were determined for each individual watershed based on the natural watershed sensitivity (USDA 2011).

ERA Coefficients

The Annual ERA value is calculated in Excel using a linear decay of the ERA coefficient. The basic equation is:

ERA = Acres*(ERACoef-((Year-ActivityYear/Recovery)*ERACoef)))

If the activity is in the future, no ERA will be calculated until the first year of the activity. Also, if Year-ActivityYear is greater than or equal to the Recovery, then the Annual ERA is zero because the recovery time has been exceeded and effects are no longer anticipated.

ERA Coefficients and recovery timeframes are listed in the CWE analysis spreadsheets. There is no recovery timeframe for constant features such as roads, trails, buildings, etc., as those are permanent on the landscape.

Reasonably foreseeable future land management activities were considered in the ERA calculations. This included all activities on Forest Service lands that had the potential for ground disturbance as well as any other known likely future activities on private lands. Similar equations to those described above were used to calculate ERAs for future activities. See CWE analysis spreadsheets for each future activity, ERA coefficient, and recovery timeframe.

Assumptions

Action Alternatives:

The assumptions for year of implementation for each proposed treatment are documented in the CWE spreadsheets and available upon request.

Both Forest Thinning: Other Mechanical and Mechanical Fuel Treatments could be treated through either mastication or machine piling. To be conservative for the CWE analysis, machine piling was assumed because that treatment has the higher coefficients and recovery times.

Temporary road construction was assumed to all occur in the first year of timber harvest (2023). A GIS exercise by the layout forester determined that 0.8 miles of temporary road per 1,000 acres of timber harvest was likely needed for Alternatives 1 and 3, and that 0.6 miles of temporary road per 1,000 acres of timber harvest was likely needed for Alternative 4. This does not include temp roads to landings that are less than 300 feet. Compaction on temporary roads was assumed to be the same as local permanent roads (1.7 acres/mile) but are for a shorter time frame as the temporary roads will be decommissioned.

There are multiple options of treatments for invasive weeds. For the CWE analysis, it was assumed that all weeds were treated annually for five years utilizing hand pull and dig techniques, as these techniques have the highest potential ground disturbance of all potential treatments (and thus highest ERA coefficients and recovery times).

Condition-Based Action Alternatives:

Future identification of invasive plant species could be treated under Alternatives 1 and 3. The known weed population was doubled as an estimate of future treatment needs. Due to low ERA coefficient and short recovery timeframe, updated ERA calculations will not be made every time a new population of noxious weeds is discovered.

Insect-, disease-, drought-, or fire-killed roadside hazard trees may be salvaged along maintenance level (ML) 2-5 roads under Alternatives 1 and 3. A GIS exercise was completed to determine where this could potentially happen. The assumptions associated with this GIS exercise are documented in the CWE spreadsheets. All roadside acreage that was determined to have the potential for roadside hazard tree

treatment in the future were included in the ERA calculations for Alternatives 1 and 3. To be conservative, it was assumed that all treatments happened in one year.

Salvage of insect-, disease-, or drought-killed trees is allowed within 1/4 mile of roads under Alternatives 1 and 3, as long as the TOC isn't exceeded. If these salvage activities are proposed in the SERAL project area in the future, the ERA calculations will be updated to ensure the TOC is not exceeded. ERA coefficients and recovery timeframes outlined in the ERA analysis worksheets will be used. These activities will not be authorized under SERAL in any watershed where the TOC is exceeded. Amount of salvage may be scaled down in order to remain under the TOC. Because the location and extent of this potential future activity is unknown, and because the potential future activity would not be authorized if a TOC is exceeded, this activity is not in the ERA calculation spreadsheet.

Salvage of up to 500 acres of wildfire-killed trees could also occur in each watershed under Alternatives 1 and 3 as long as the TOC is not exceeded. If these fire salvage activities are proposed in the SERAL project area in the future, the ERA calculations, including the effects of the fire itself, will be updated to ensure the TOC is not exceeded. ERA coefficients and recovery timeframes outlined in the ERA analysis worksheets will be used. These activities will not be authorized under SERAL in any watershed where the TOC is exceeded. Amount of salvage may be scaled down in order to remain under the TOC. Because the location and extent of this potential future activity is unknown, and because the potential future activity would not be authorized if a TOC is exceeded, this activity is not in the ERA calculation spreadsheet.

Previous Activities:

If type of piling was not specified, assumed machine (dozer) piling.

Constant Features:

The following acreage and compaction assumptions were made:

- Campgrounds/boating sites/picnic sites = 70% compaction of total recreation site area
- Building points = 0.1 ac each
- Dispersed campsites = 0.05 ac each
- Quarry/pit mine - small = 0.1 ac each
- Pit-small (<0.5) = 0.4 ac each
- Tanks/tower – large = 0.1 ac each
- Tanks/tower – small = 0.05 ac each

Other Future Activities:

- If Implementation year is unknown, assumed half acreage in 2021 and half acreage in 2022
- If type of piling was not specified, assumed machine (dozer) piling
- ERA coefficient for salvage was used for units that had a combination of salvage with other timber/fuels treatments (e.g. thin, hand thin, biomass removal, hazard tree removal, mastication), as salvage has the highest coefficient.
- Did not count pile burning as a separate, additive activity if the main timber/fuels activity in the same unit had a larger ERA coefficient (e.g. salvage, hazard tree removal, thinning or biomass removal), as piling is considered part of those larger treatments.
- Did not count hand thinning and/or mastication as a separate, additive activity if the main timber/fuels activity in the same unit had a larger ERA coefficient (e.g. salvage, hazard tree removal, thinning, or biomass removal).

Results

Modeling results indicate that the largest increases in ERA would occur in the Cow Creek-Middle Fork Stanislaus River and the Middle South Fork Stanislaus River watersheds (Table 7). ERAs in these watersheds are 3 to 4 higher under Alternative 1 than under the no action alternative. Despite the increase from the proposed action and action alternatives, the analysis did not predict the TOC to be exceeded in any watershed under any action alternative. ERA values would not increase under the no action alternative. However, goals of the SERAL project, including treatment of fuels and reintroduction of fire to reduce the likelihood of stand-replacing wildfire, would not be achieved.

Table 7. Highest Percent ERA by Watershed and Alternative and Predicted Year

HUC 6 Watershed Name	TOC for Watershed	Highest % ERA Alternative 1 & Year	Highest % ERA Alternative 2 & Year	Highest % ERA Alternative 3 & Year	Highest % ERA Alternative 4 &Year	TOC Exceeded? (Y/N)
Cow Creek-Middle Fork Stanislaus River	10	7.08(2027)	2.58 (2022)	5.78 (2026 & 2027)	4.50(2026)	N
Dry Meadow Creek-Middle Fork Stanislaus River	12	3.72 (2027)	1.32 (2022)	2.81 (2026)	2.31 (2026)	N
Lower South Fork Stanislaus River	14	4.03 (2027)	3.58 (2022)	4.02 (2027)	3.64 (2027)	N
Middle South Fork Stanislaus River	12	7.78 (2025)	3.83 (2022)	6.58 (2025)	5.32 (2024)	N
Rose Creek	12	3.67 (2028)	1.10 (2022)	3.18 (2028)	2.74 (2028)	N
Stony Gulch-Stanislaus River	14	1.49 (2022)	1.46 (2022)	1.49 (2022	1.48 (2022	N

Results of the CWE modeling and field evaluation of stream and hillslope conditions indicate that treatments in the action alternatives, in conjunction with constant features, past activities, and other foreseeable future activities in the CWE watersheds, pose a low risk of causing adverse off-site cumulative effects in these watersheds.

CWE modeling for the action alternatives was based off GIS layers of proposed activities. Some changes to treatment boundaries are anticipated when implementation units are developed. A sensitivity analysis was completed to determine if these adjustments to unit boundaries are likely to result in TOCs being exceeded. Revised ERA calculations were completed where "forest thinning: other mechanical" was given the ERA coefficients of "forest thinning harvest: tractor", as tractor harvest has the largest coefficients (greatest potential disturbance). Even with increasing the acreage of tractor logging ground, the TOCs were not exceeded in any watershed under any action alternative. Therefore, it is unlikely that anticipated adjustments to treatment unit boundaries would result in TOCs being exceeded. If, however, TOCs were exceeded in the future, then the additional monitoring and reporting requirements of the Central Valley Regional Water Quality Control Board Timber General Order would be triggered.

Floodplains, Wetlands, and Municipal Watersheds

Affected Environment

Executive Order (EO) 11988 directs federal agencies to avoid to the extent possible the impacts associated with the destruction or modification of floodplains. It defines floodplains as, "…the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent [100-year recurrence] or greater chance of flooding in any one year." Floodplains are found along streams in the project area.

EO 11990 directs federal agencies to avoid to the extent possible the impacts associated with the destruction or modification of wetlands. It defines wetlands as, "…areas inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds." Wetlands within the project area include wet meadows, seeps/springs, and stream channels.

Forest Service Manual 2542.05 defines municipal watersheds as, "A watershed that serves a public water system as defined in the Safe Drinking Water Act of 1974, as amended (42 U.S.C. §§ 300f, et seq.); or as defined in state safe drinking water statutes or regulations." The Central Valley Regional Water Quality Control Board lists both the Stanislaus River basin and its tributaries (sources to New Melones) and the Tuolumne River Basin and its tributaries (sources to New Don Pedro Reservoir) as municipal domestic water supplies. While the SERAL project area is mostly located in the Stanislaus River Basin, a small portion of the project area is located in the Upper Tuolumne River watershed.

Indicators and Measures

Qualitative Assessment of the Impacts of Proposed Activities on Floodplains:

A qualitative assessment of the impacts of the treatments on floodplains is needed to determine if direction under EO 11988 Floodplain Management is being followed.

Qualitative Assessment of the Impacts of Proposed Activities on Wetlands:

A qualitative assessment of the impacts of the treatments on wetlands is needed to determine if direction under EO 11990 Protection of Wetlands is being followed.

Qualitative Assessment of the Impacts of Proposed Activities on Municipal Watersheds:

A qualitative assessment of the impacts of the treatments on municipal watersheds is needed to determine if direction under FSM 2542.05 is being followed.

Direct and Indirect Effects

Impacts of Proposed Activities on Floodplains:

Prescribed BMPs that guide management activities within and adjacent to riparian areas would be implemented under the action alternatives. These BMPs, such as mechanized equipment buffers, would minimize adverse effects to floodplains.

Impacts of Proposed Activities on Wetlands:

Prescribed BMPs that guide management activities adjacent to wetlands would be implemented under the action alternatives. These BMPs, such as mechanized equipment buffers, would minimize adverse effects to wetlands.

Impacts of Proposed Activities on Municipal Watersheds:

BMPs designed to protect water quality have been specified for this project and would be implemented during all project activities. These BMPs are expected to minimize adverse effects of the SERAL project on municipal watersheds.

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